Informing Policies: Implications of the IPCC's Fourth Assessment (AR4)

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Co-CLA WG III

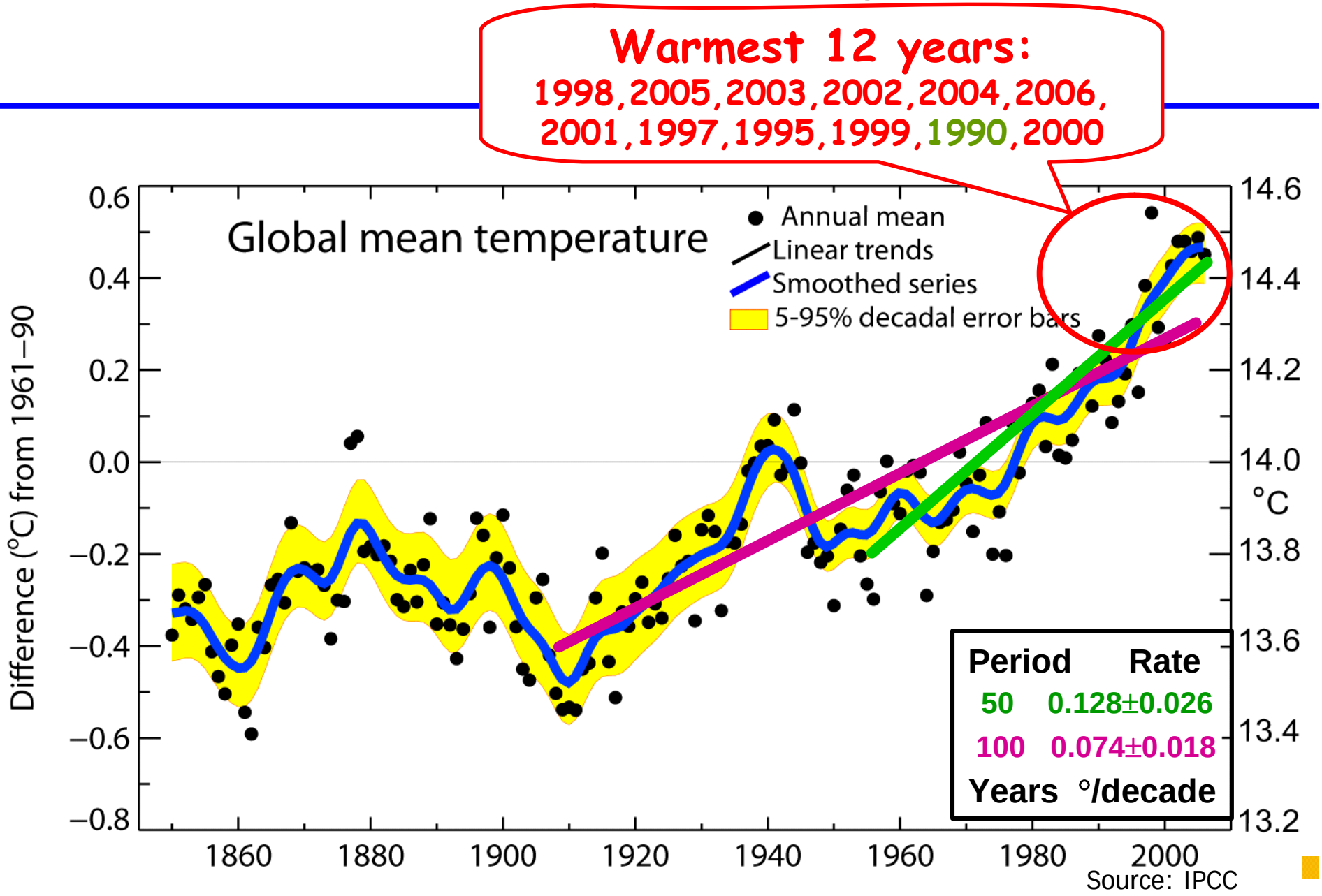
Based on material from

R.K. Pachauri and Bert Metz

The Haagen-Smit Symposium
Seventh Annual Meeting, May 14-17, 2007,
Seascape, Aptos, CA

WG I and WG II Findings

Global mean temperatures are rising faster with time

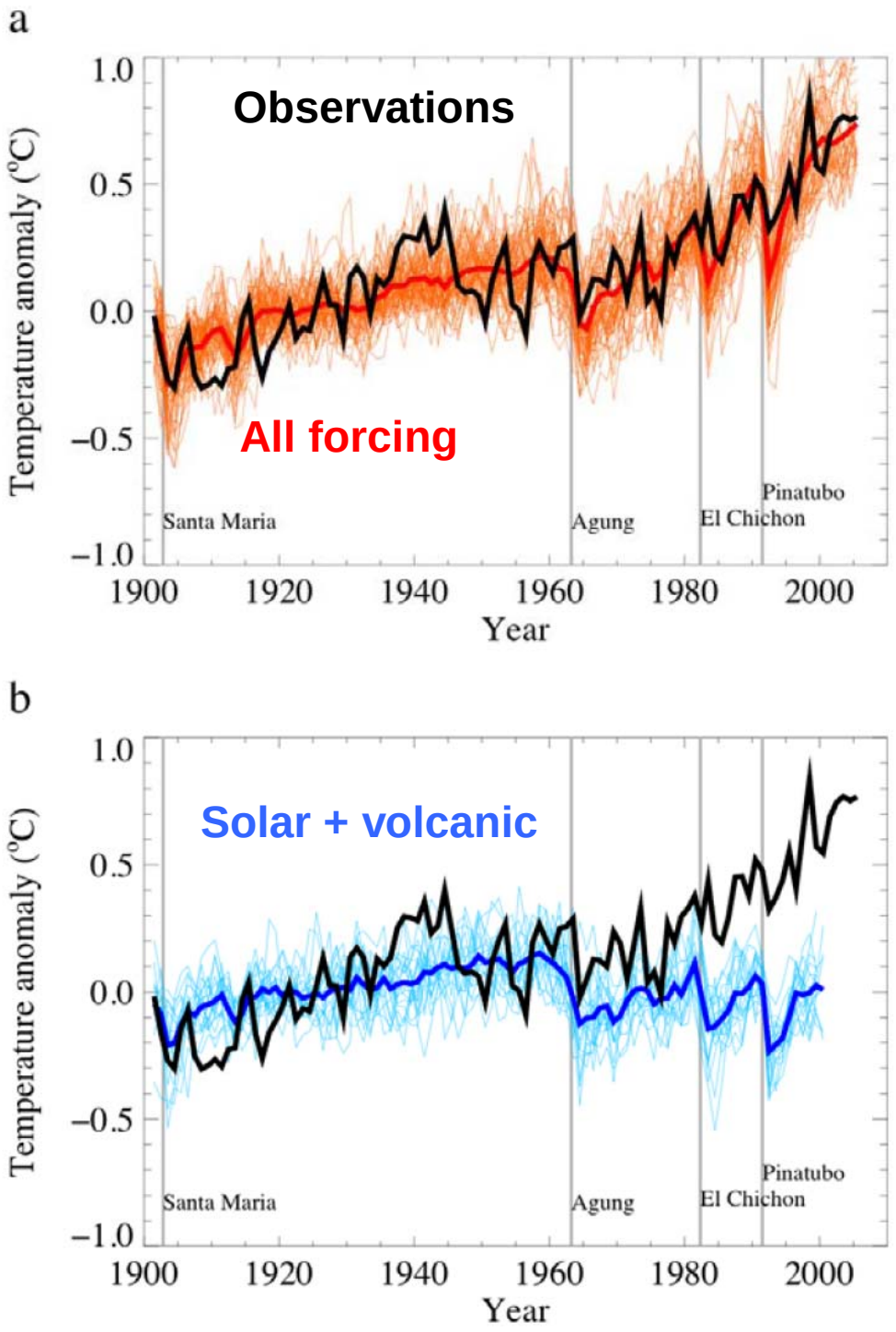


Attribution

- Observed changes are consistent with

☑ Expected responses to forcings

☒ Inconsistent with alternative explanations

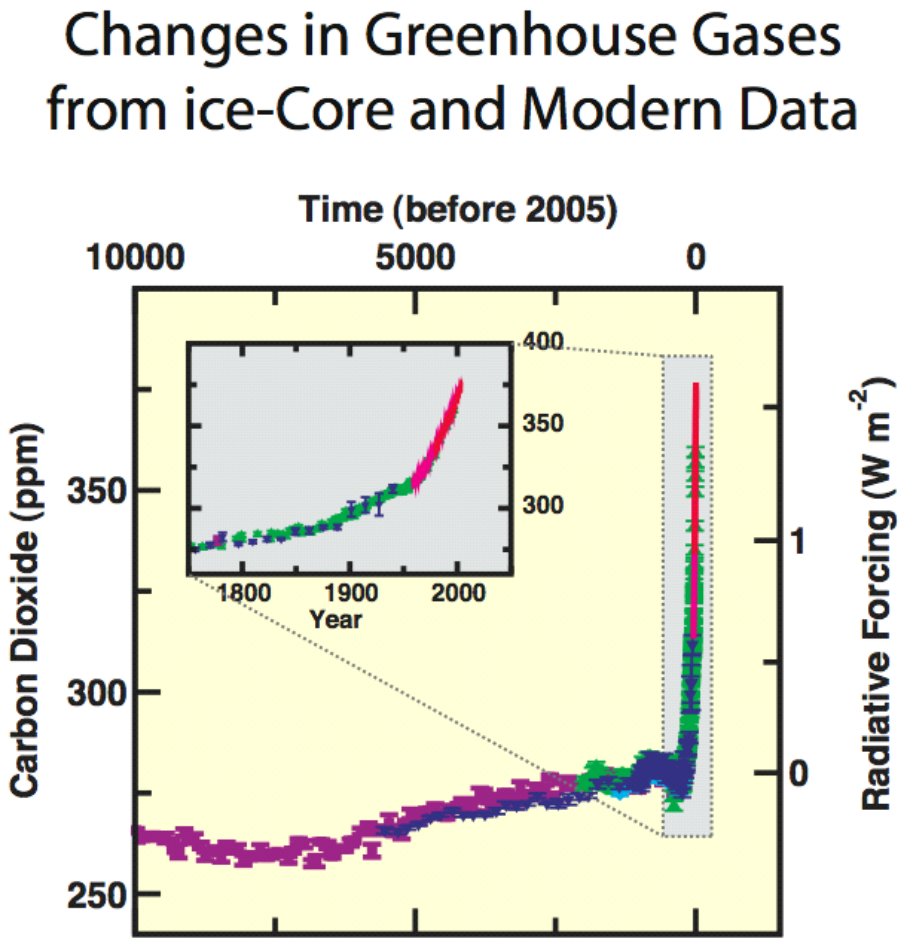


Source: IPCC

Human and Natural Drivers of Climate Change: Unprecedented

Dramatic rise in the industrial era

• Largest growth rate of CO2 seen over the last ten years (1995-2005) than in any decade at least since direct measurements began (1960).

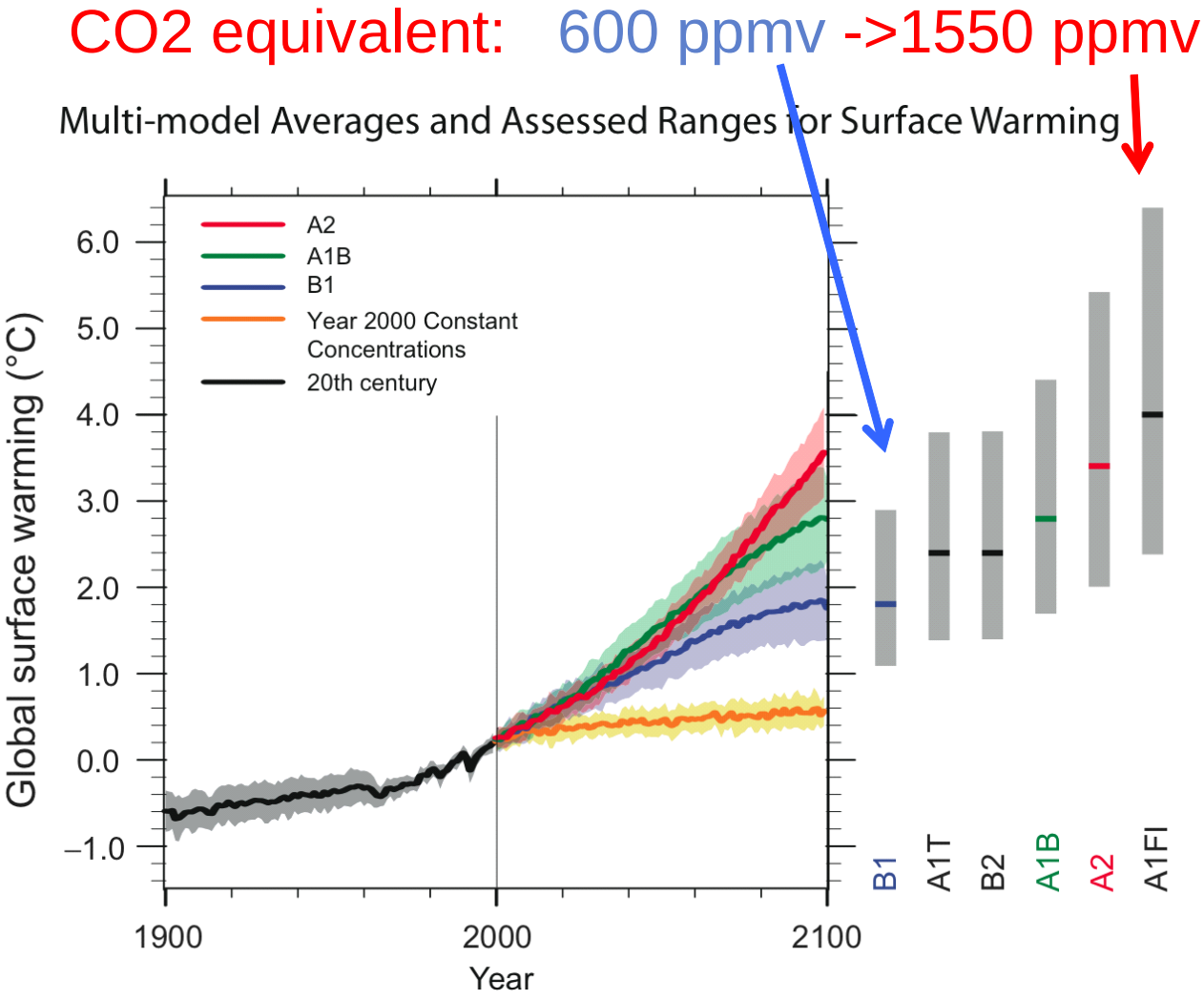


Projections of Future Changes in Climate

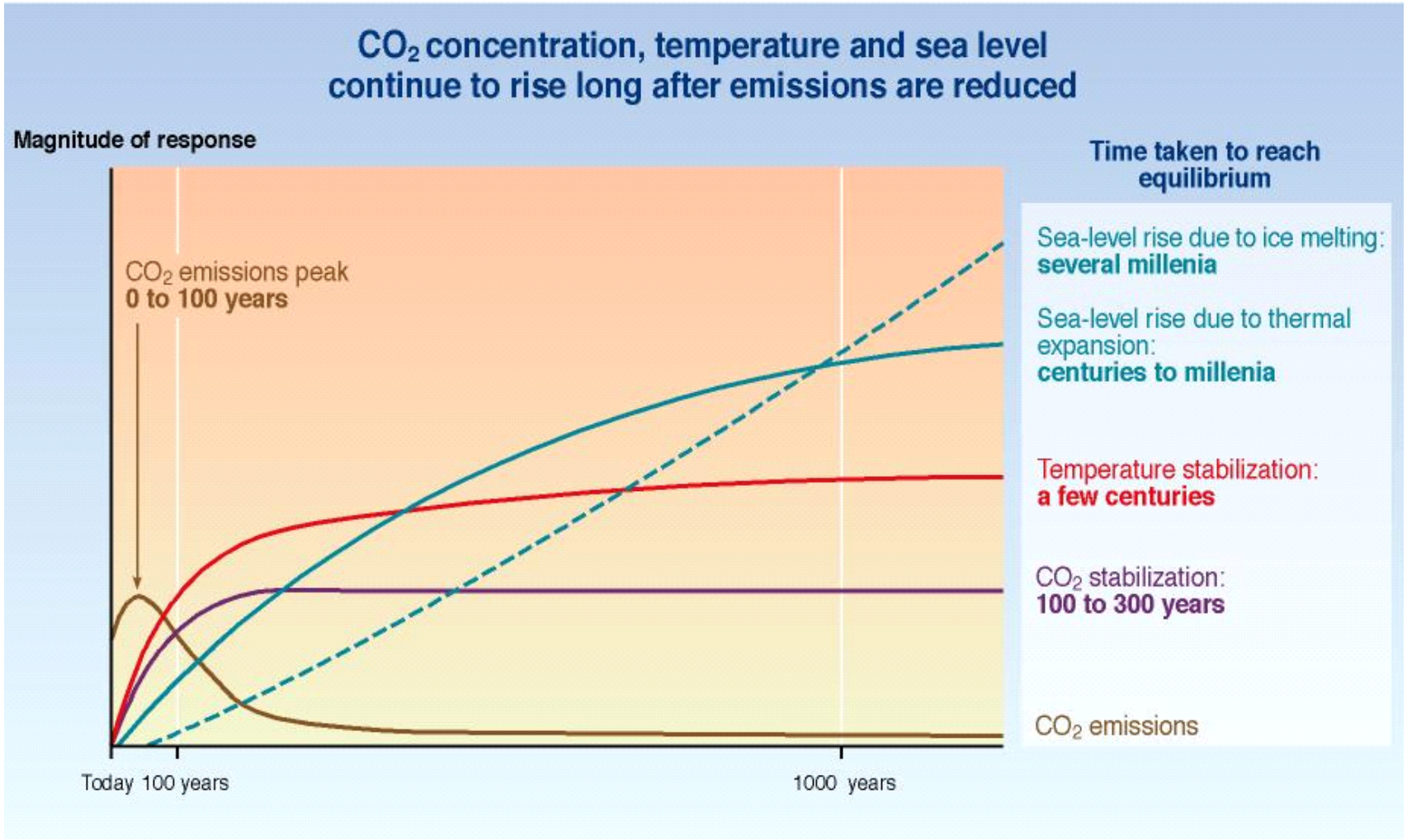
The long-term future depends on human choices about emissions. Best estimates and likely ranges given in IPCC for the first time.

In 2100: 600 ppmv CO2 equiv (B1) Best estimate is +1.8°C by 2100; likely 1.1-2.9°C further warming;

Or 1550 ppmv (A1FI) Best 4°C [likely 2.4-6.4°C]



CO_2 Concentrations, Temperature and Sea Level Continue to Rise Long After Emissions are Reduced

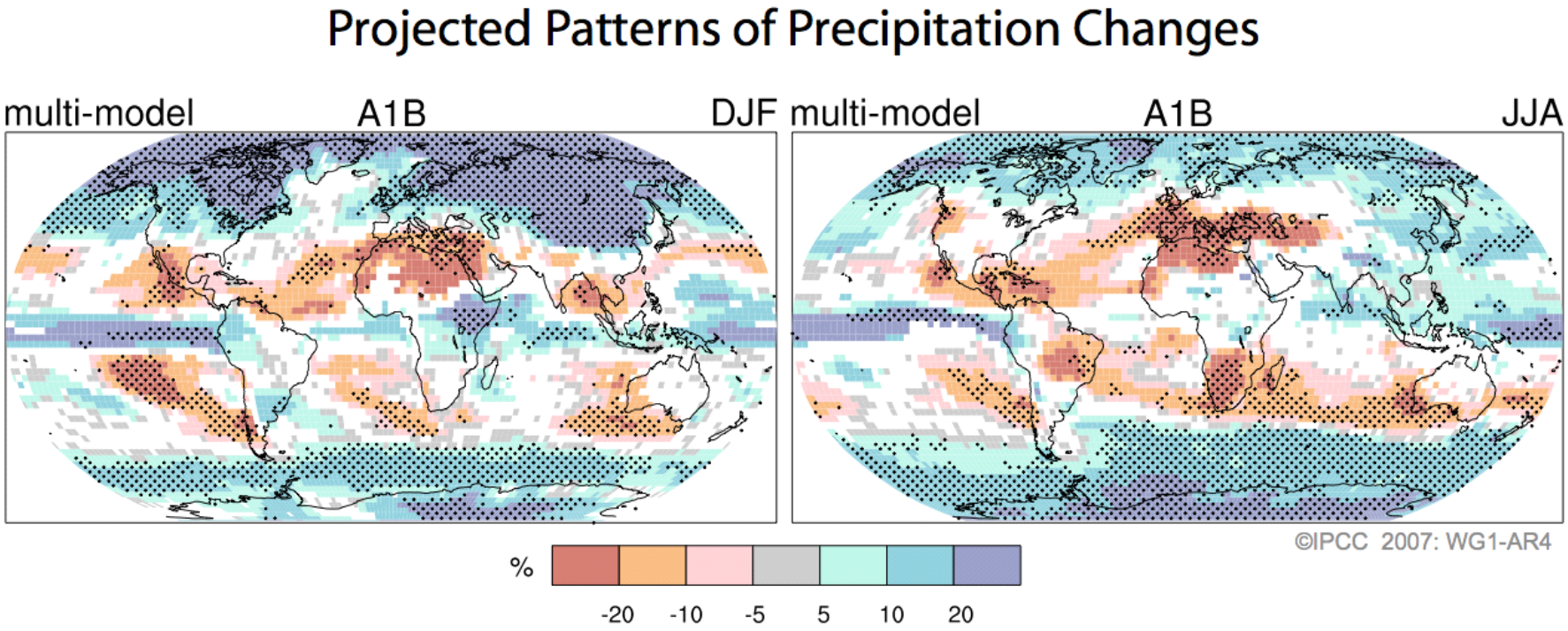


Projections of Future Changes in Climate: Committed Warming is Coming

- **For the next two decades a warming of about 0.2°C per decade is projected for a range of SRES emission scenarios**

- **Even if the concentrations of all greenhouse gases and aerosols had been kept constant at year 2000 levels, a further warming of about 0.1°C per decade would be expected**

Projections of Future Changes in Climate

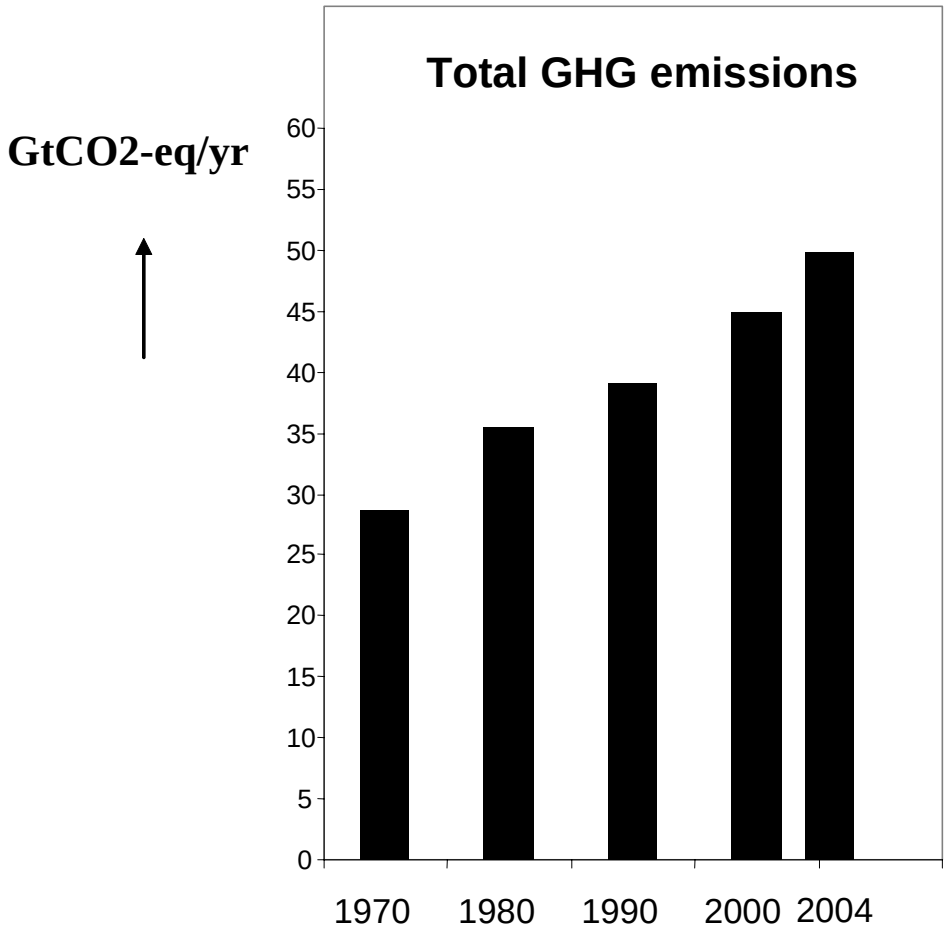


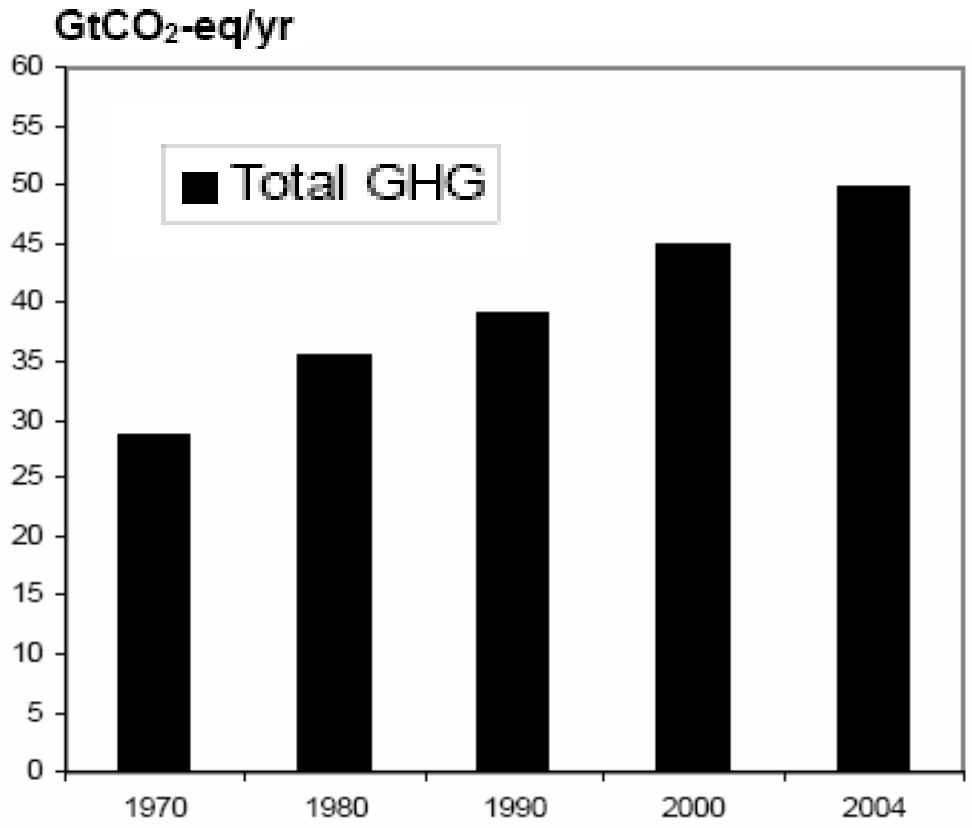
Brand new in AR4: Drying in much of the subtropics, more rain in higher latitudes, continuing the broad pattern of rainfall changes already observed.

More heavy precipitation and more droughts….

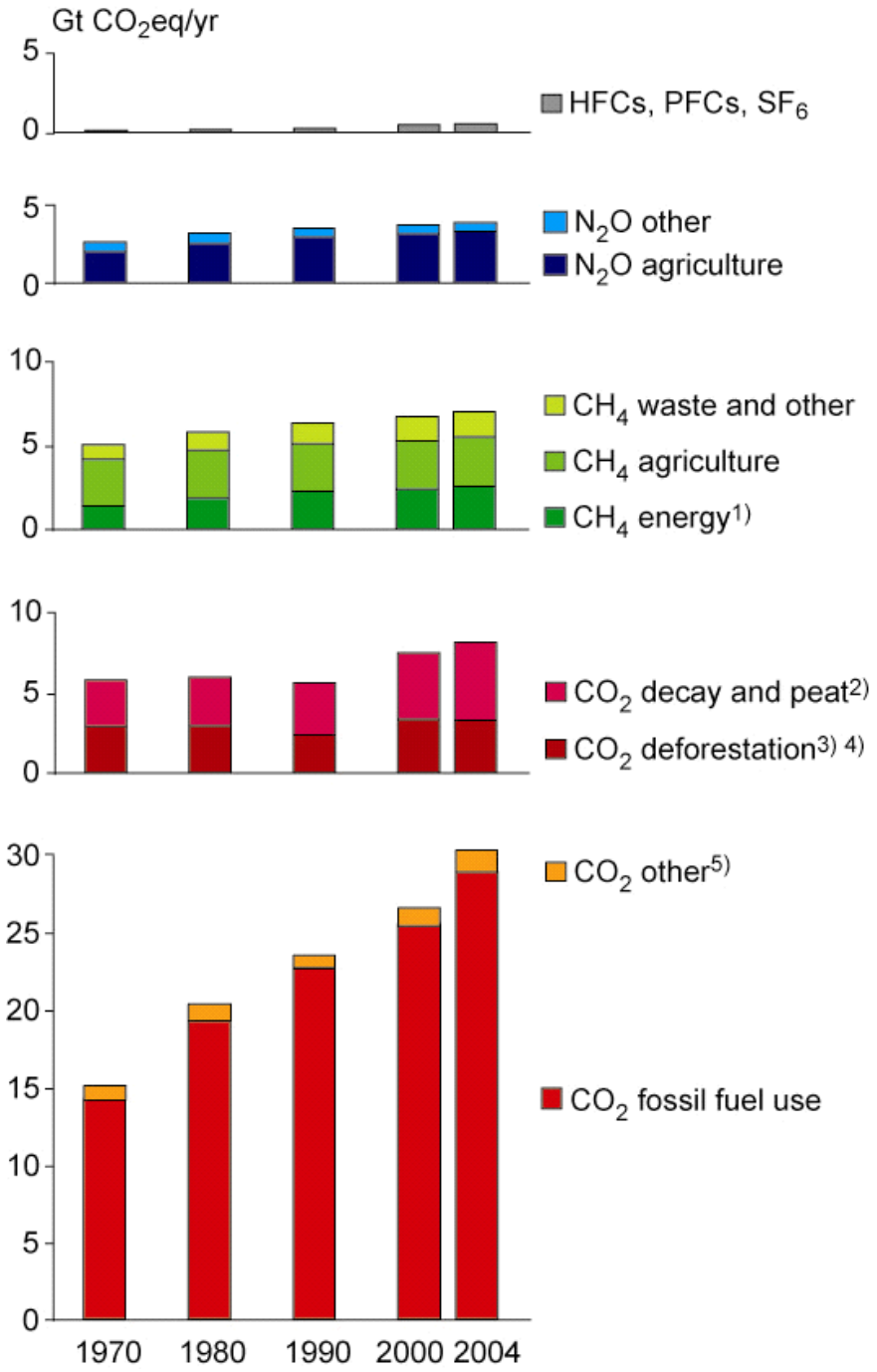
WG III Findings

Between 1970 and 2004 global greenhouse gas emissions have increased by 70 %

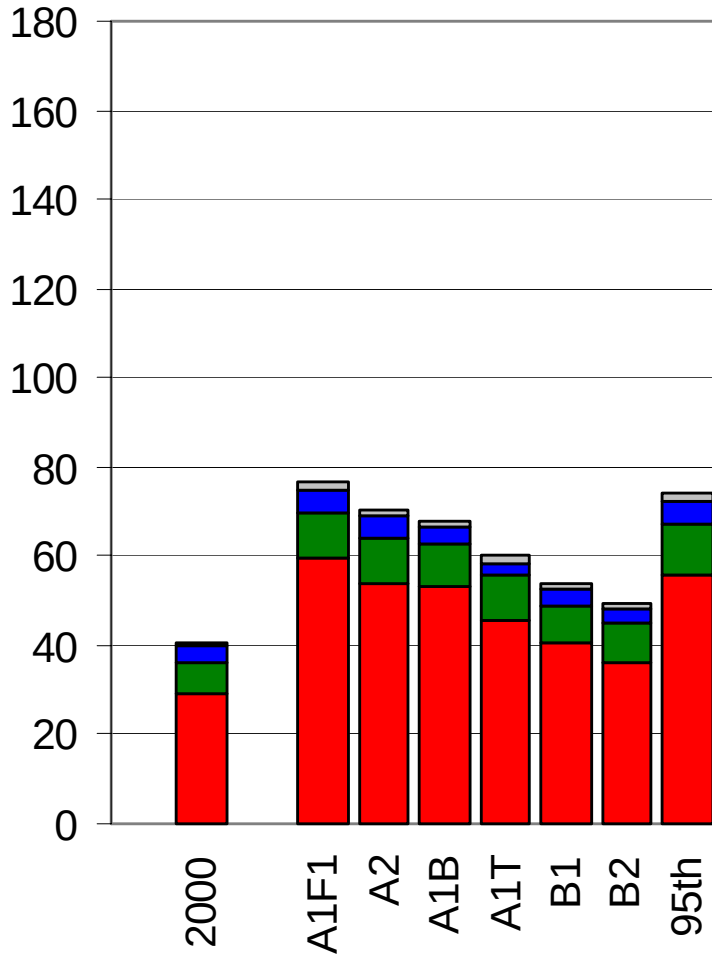




Carbon dioxide is the largest contributor



With current climate change mitigation policies *and related sustainable development practices*, global GHG emissions will con
the next few dec



IPCC SRES Scenarios:

- 2030 GHG emissions 50-76 Gt CO_2 or 25-90% higher relative to 2000

Mitigation potentials

- ***Economic potential:***
  - takes into account social costs and benefits and social discount rates,
  - assuming that market efficiency is improved by policies and measures and
  - barriers are removed

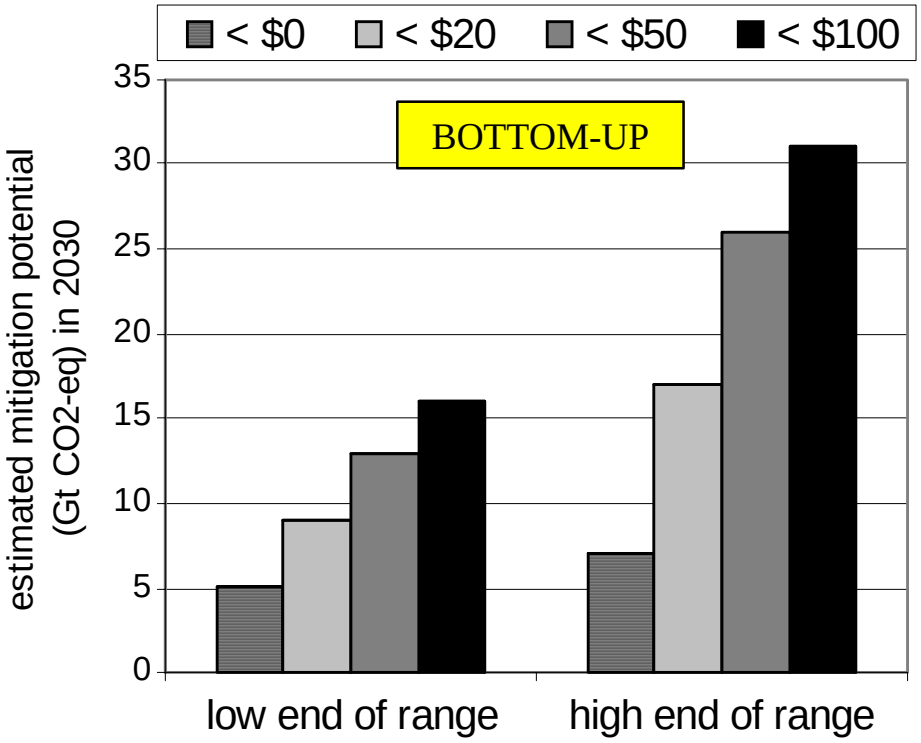
- ***Market potential:***
  - based on private costs and private discount rates
  - expected to occur under forecast market conditions
  - including policies and measures currently in place
  - noting that barriers limit actual uptake

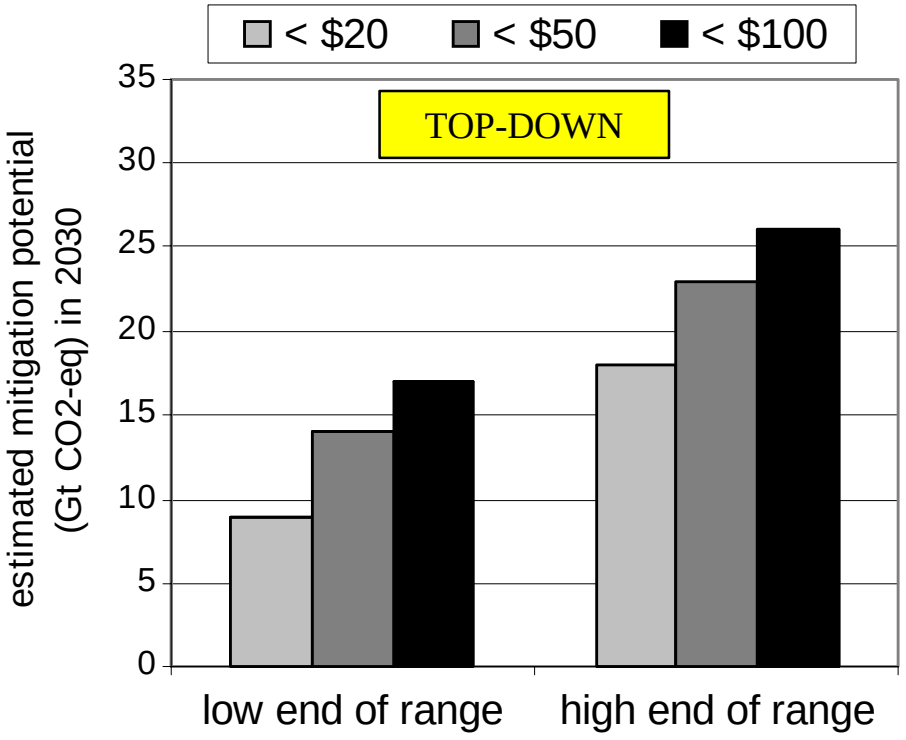
What does US$ 50/ tCO2eq mean?

- Crude oil: ~US$ 25/ barrel
- Gasoline: ~12 ct/ litre (50 ct/gallon)
- Electricity:
  - from coal fired plant: ~5 ct/kWh
  - from gas fired plant: ~1.5 ct/kWh

Substantial economic potential for the mitigation of global GHG emissions over the coming decades

Potential could offset the projected growth of global emissions, or reduce emissions below current levels

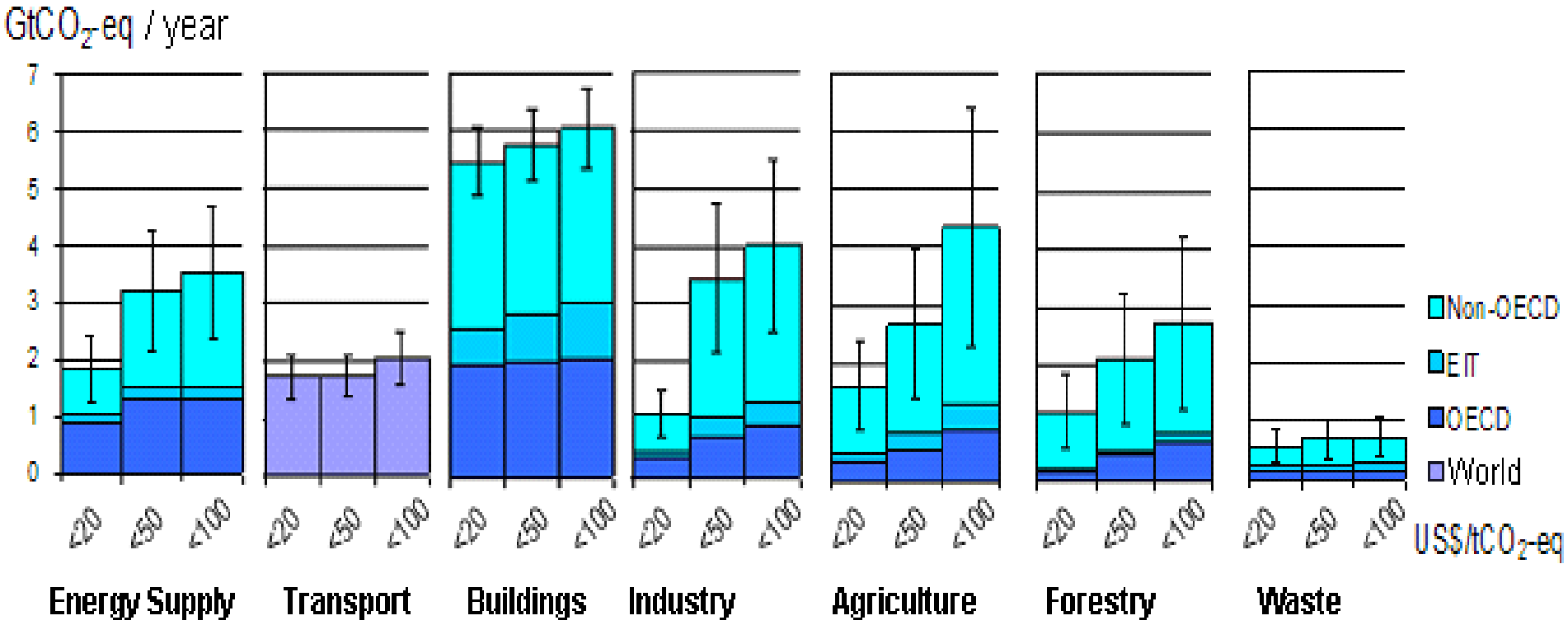




Emissions 2004: 43GtCO2eq: 2030: SRES A1B: 68GtCO2eq ; SRES B2: 49 GtCO2eq

Note: estimates do not explicitly include non-technical options such as lifestyle changes

All sectors and regions have the potential to contribute



Note:

- Sectoral estimates are based on bottom-up studies
- Estimates do not explicitly include non-technical options, such as lifestyle changes.

Changes in lifestyle and behaviour patterns can contribute to climate change mitigation

- **Buildings:** Changes in occupant behaviour, cultural patterns and consumer technology choice and usage
- **Transport:** Reduction of car usage and efficient driving style, improved urban planning including public transport
- **Industry:** Staff training, regular feedback, reward systems, documentation of current practices can overcome organizational barriers

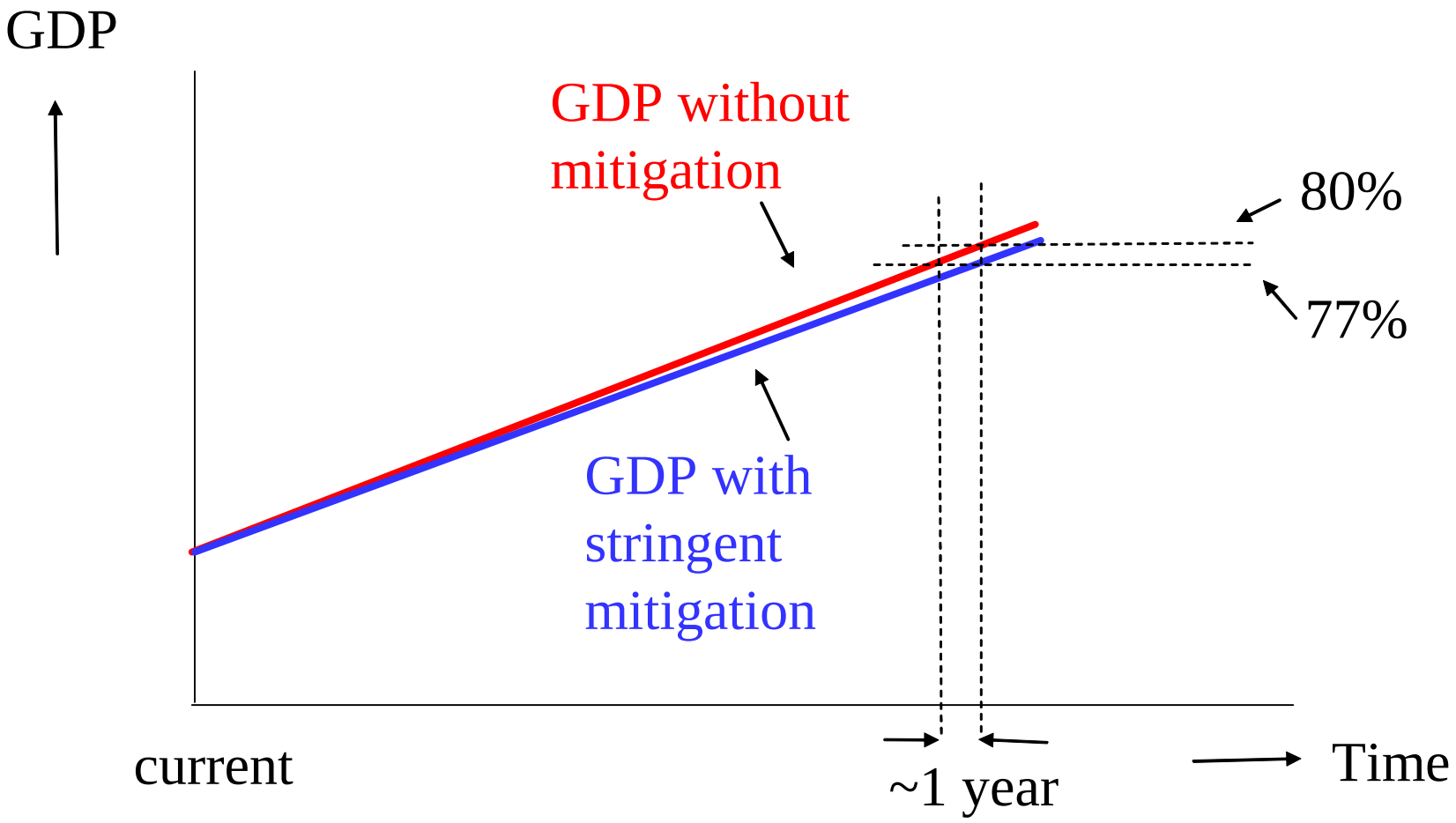
What are the macroeconomic costs in 2030?

- Costs are global average for least-cost approaches from top-down models
- Costs do not include co-benefits and avoided climate change damages

Trajectories towards stabilization levels (ppm CO_2-eq)	Median GDP reduction[1] (%)	Range of GDP reduction [2] (%)	Reduction of average annual GDP growth rates [3] (percentage points)
590-710	0.2	-0.6 – 1.2	< 0.06
535-590	0.6	0.2 – 2.5	<0.1
445-535[4]	Not available	< 3	< 0.12

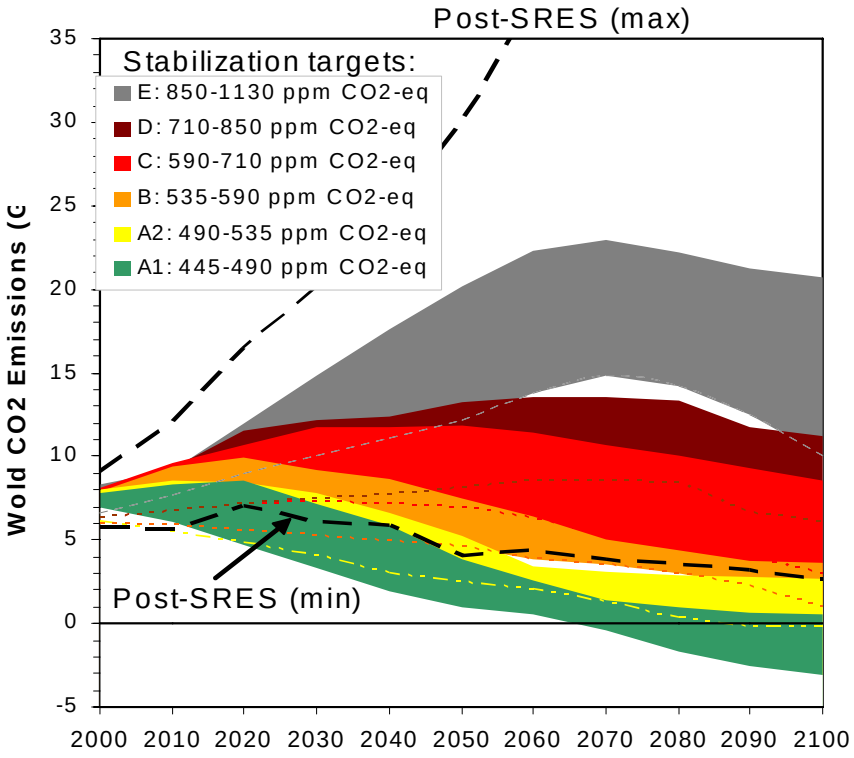
[1] This is global GDP based market exchange rates
[2] The median and the 10th and 90th percentile range of the analyzed data are given
[3] The calculation of the reduction of the annual growth rate is based on the average reduction during the period till 2030 that would result in the indicated GDP decrease in 2030
[4] The number of studies that report GDP results is relatively small and they generally use low baselines

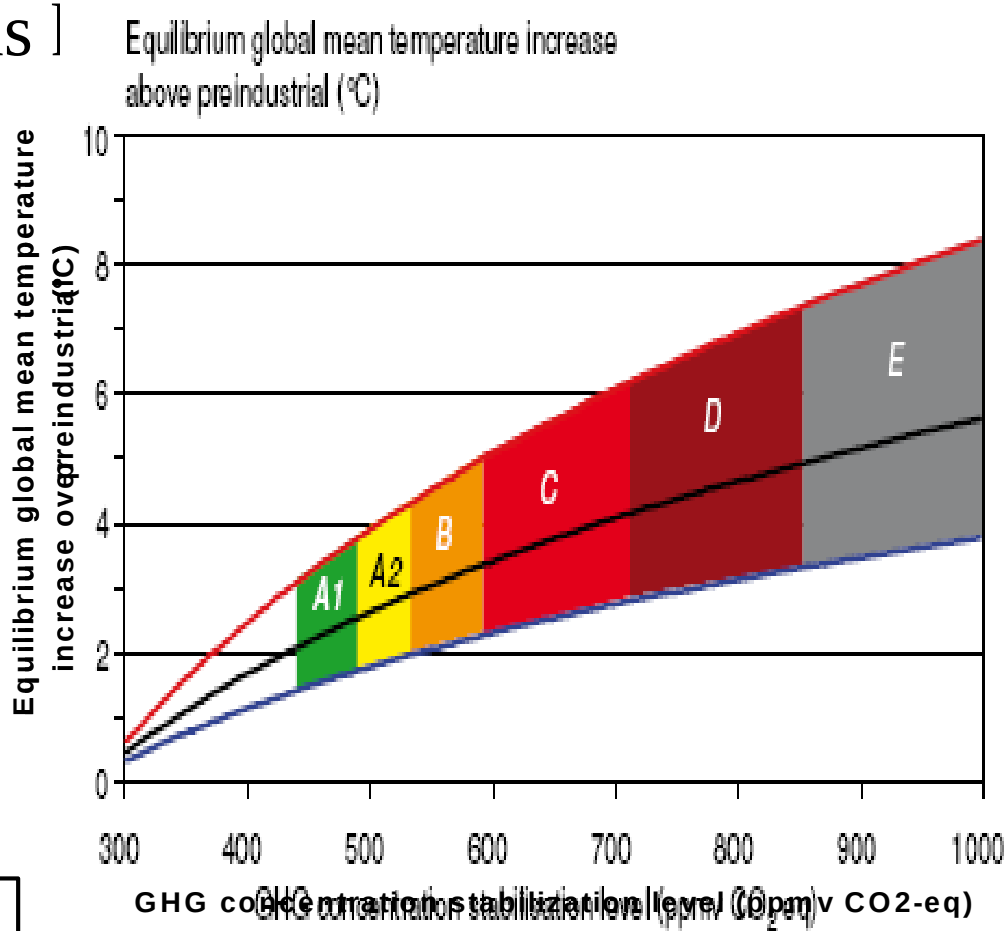
Illustration of cost numbers



Long-term mitigation: stabilisation and equilibrium global mean temperatures

- The lower the stabilisation level the earlier global CO2 emissions]





Multigas and CO2 only studies combined

Long term mitigation (after 2030)

Mitigation efforts over the next two to three decades will have a large impact on opportunities to achieve lower stabilization levels

Stab level (ppm CO2-eq)	Global Mean temp. increase at equilibrium (ºC)	Year CO2 needs to peak	Reduction in 2050 CO2 emissions compared to 2000
445 – 490	2.0 – 2.4	2000 - 2015	-85 to -50
490 – 535	2.4 – 2.8	2000 - 2020	-60 to -30
535 – 590	2.8 – 3.2	2010 - 2030	-30 to +5
590 – 710	3.2 – 4.0	2020 - 2060	+10 to +60
710 – 855	4.0 – 4.9	2050 - 2080	+25 to +85
855 – 1130	4.9 – 6.1	2060 - 2090	+90 to +140

Policies are available to governments to realize mitigation of climate change

- Studies of economic potentials show what might be achieved if *appropriate new and additional policies* were put into place to remove barriers and include social costs and benefits

- Applicability of national policies depends on national circumstances, their design, interaction, stringency and implementation

- The literature suggests that successful international agreements are *environmentally effective*, *cost-effective*, *incorporate distributional considerations and equity*, and are *institutionally feasible*

Policies are available to governments to realize mitigation of climate change

- *Regulations and standards* generally provide some certainty about emission levels. However, they may not induce innovations and more advanced technologies.
- *Taxes and charges* can set a price for carbon, but cannot guarantee a particular level of emissions. Literature identifies taxes as an efficient way of internalizing costs of GHG emissions.
- *Tradable permits* will establish a carbon price. Fluctuation in the price of carbon makes it difficult to estimate the total cost of complying with emission permits.
- *Financial incentives* (subsidies and tax credits) -- While economic costs are generally higher than for the instruments listed above, they are often critical to overcome barriers.
- *Voluntary agreements* between industry and governments are politically attractive, and raise awareness among stakeholders. The majority has not achieved significant emissions reductions beyond baseline. However, some recent agreements, in a few countries, have accelerated the application of best available technology and led to measurable emission reductions.
- *RD&D* can stimulate technological advances, reduce costs, and enable progress toward stabilization.

An effective carbon-price signal could realize significant mitigation potential in all sectors

- Policies that provide a real or implicit price of carbon could create incentives for producers and consumers to significantly invest in low-GHG products, technologies and processes.
- Such policies could include economic instruments, government funding and regulation
- For stabilisation at around 550 ppm CO2eq carbon prices should reach 20-80 US$/tCO2eq by 2030 (5-65 if “induced technological change” happens)
- At these carbon prices large shifts of investments into low carbon technologies can be expected

Two-way Relationship Between Climate Change and Sustainable Development

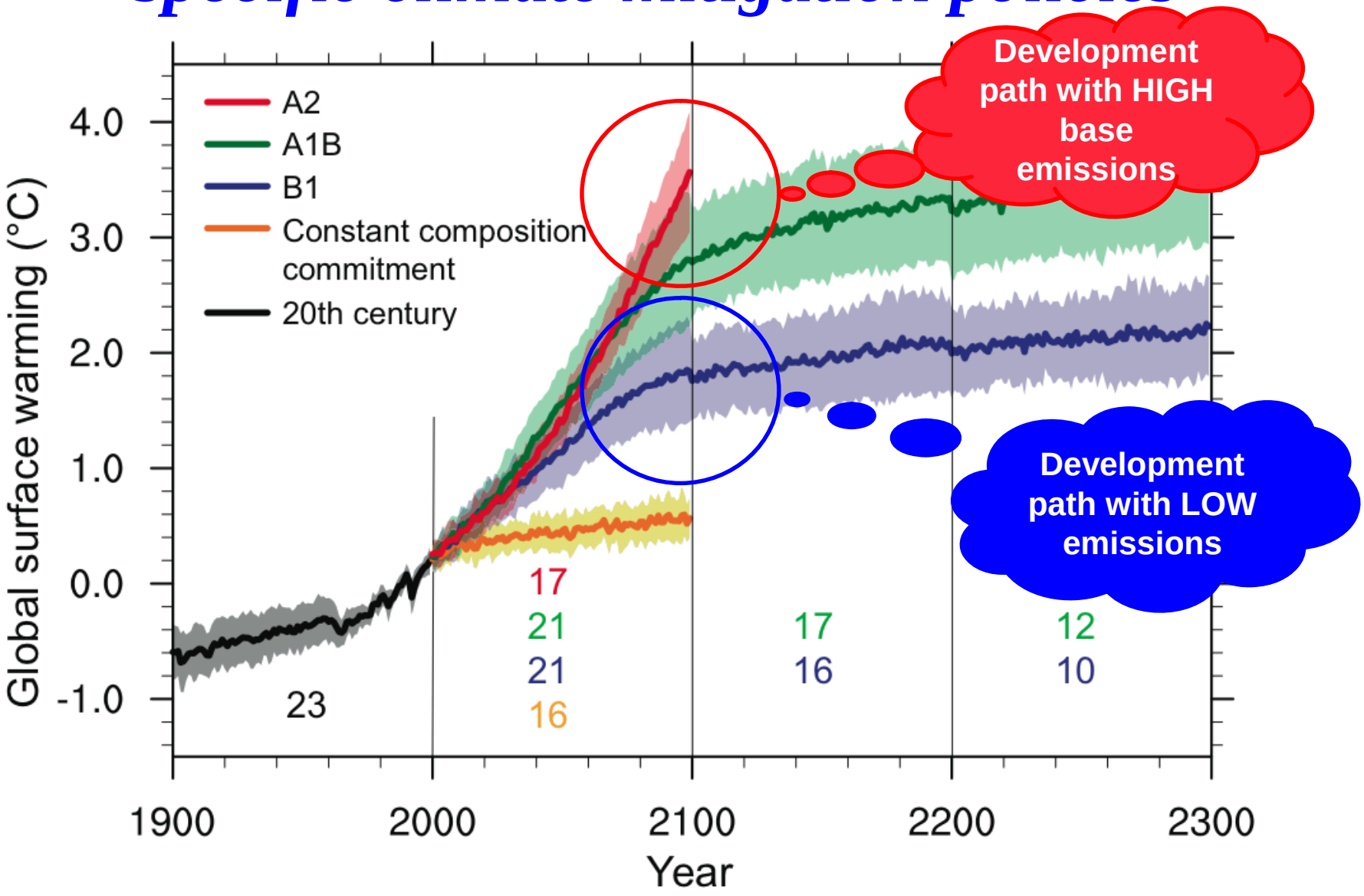
A. Climate policy can have positive or negative effects on other factors

-- Ancillary benefits or co-benefits

B. Non-climate development policies can influence GHG emissions as much as specific climate policies

-- Requires mainstreaming climate change in decision-making

B Development path as important as specific climate mitigation policies



IPCC

B

Non-climate policies can influence GHG emissions as much as specific climate policies

Sectors	Non-climate policies -- Candidates for integrating climate concerns	Possible influence (% of global emissions)
Macro-economy	Taxes, subsidies, other fiscal policies	All GHG emissions (100 %)
Forestry	Forest protection, sustainable management	GHGs deforestation (7%)
Electricity	Renewable energy, demand management, decreasing losses transport,/distribution	Electricity sector emissions (20 %)
Oil-imports	Diversification energy sources/decrease intensity -> enhance energy security	GHGs from oil product imports (20 %)
Insurance buildings, infrastructure	Differentiated premiums, liability conditions, improved conditions green products	GHG emissions buildings, transport (20 %)
Bank lending	Strategy/policy, lending projects accounting for options emission limitations	Notably development projects (25%)
Rural energy	Policies promoting LPG, kerosene and electricity for cooking	Extra emissions over biomass (<2 %)

Conclusions

- Integrating climate mitigation in development decisions with climate consequences is essential for a low-emissions path to emerge
- Entities – state, markets, and civil society – at all levels need to participate in the mainstreaming process
  - National, state, and local governments,
  - Oranized and unorganized industry,
  - Non-governmental organizations, and
  - General public

The IPCC Summaries for Policy Makers (SPMs) can be downloaded from www.ipcc.ch

Thank you
www.ies.lbl.gov